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VOL. XXIX, No. 18. SEPTEMBER 1, 1932

THE JOURNAL OF PHILOSOPHY

THE DIRECTIVE INFLUENCE IN LIVING ORGANISMS

ALTHOUGH the application of modern physics to theoretical biology is still at an early stage, there are already many signs of a far-reaching transformation in our fundamental conceptions of the physical nature of vital action. In particular, the fine-grained structure of living matter has acquired a new significance, as constituting evidence of the special importance of small-scale or intra-atomic types of determination in vital processes. Formerly, when the laws determining the transfer of energy were assumed to be of the same kind for all masses, large and small, the single atom was regarded simply as an inert body of small dimensions and negligible internal constitution, whose behavior was completely determined by the sum-total of physical influences acting upon it from outside. It had no self-determination or internal spontaneity; in the absence of external influence it preserved unaltered the state (i.e., of uniform motion in a straight line) in which it happened to be at the time. The inevitable corollary was the conception of the tightly interlocked, completely deterministic universe; alternative possibilities of action in any material system were excluded; only one outcome of any given physical configuration was possible, a view which, when carried over into physiology, furnished the chief support for the modern paradoxical conception of human conduct as completely determined by purely physical factors. But since the rise of the electron theory of atomic constitution, with the increasing experimental evidence that the behavior of single electrons is only partially controllable from outside, we have come to recognize that intra-atomic as well as external conditions must be considered in accounting for the behavior of single atoms. Two sources of determination in atomic activity are thus to be distinguished, one external, consisting of influences received directly or indirectly from other atoms, the other internal, consisting of impulses to action originating within the atom itself and apparently independent of immediate external conditions. The possibility presents itself that the latter—unrecognized by the classical physics and the physiology based upon it—may be a chief source of the directive activity or

control so highly developed in living organisms and shown especially in their development and individual behavior.[1]

The present problem has reference to the ultimate physical basis of the contrast between vital and non-vital modes of determination. All observation shows that determinateness and regularity are properties which are common, in some degree at least, to all natural systems and events, living and non-living; to this degree science must be regarded as applicable to all natural reality. But just how far it can be applied is still a question; the scientifically unamenable element in life has always seemed large, even to many professed biologists; and individual human conduct remains as much of a mystery as ever. It is not difficult to understand the main historical and psychological origins of the belief in the completely deterministic universe. By Laplace and other eighteenth-century mathematical physicists the unambiguity and complete determinateness of logical or mathematical reasoning was assumed to apply not only to the formulæ describing the behavior of physical objects, but also to the actual behavior of the objects themselves, considered as independent facts in an external nature. The formal correspondence was regarded as equivalent to a complete correspondence; natural behavior then became as invariant and subject to rigid rule as the behavior of the terms in mathematical equations; and there seemed to be ample experiential confirmation of this conclusion, especially from the facts of astronomy.

But since it is now realized that all scientific representation is abstract and approximate, and in no sense a complete replica of natural reality, the ascription of complete determinateness[2] to nature, extending to its minutest inner details, is no longer a logically necessary one; it becomes, in fact, subject to the uncertainty attending all extrapolation in natural science. The scientific search for determinateness will proceed as formerly; but it now recognizes the possibility that in any single natural event arbitrary or individual factors may enter which are not (or not yet) subject to rule. In an evolving universe not all of the rules are yet made; stable stations are reached from time to time; but so long as nature exhibits evolutionary advance there must be at least some indetermination, since when a thing happens for the first time we can not point to any permanent or constantly acting pre-existing factors which determine unequivocally its special particularity. The unpredictable is such

[1] Professor F. G. Donnan, in a paper contributed to *Scientia* in 1918, points out the contrast between the law of action of the individual and that of the multitude in any statistical assemblage, and suggests that the action of individual atoms may be of decisive importance in biological phenomena (*Scientia*, 1918, Vol. XXIV, p. 282).

[2] Complete determinateness would be the rigid exclusion of alternatives, i.e., the existence of only one possibility of action at any given juncture.

not merely because of incomplete knowledge, but because there actually exists an element of spontaneity or freedom from rule in each natural occurrence. The residuum of natural fact not subsumed under the scientific formula thus furnishes a field in which the novel or indeterminate may assert itself. The limits of possible exactitude in physical measurement are now precisely defined by the Heisenberg principle; and although some physicists may still maintain (in fact do maintain) that this experimental disability need not imply the absence of strict determination beyond the limits thus defined,[3] the burden of proof is on them. We can at least see how the belief in complete physical determinateness arose historically, through an overestimate of the degree of correspondence between the scientific concept or formula and the natural fact itself; and the recognition of large-scale causality as statistical, while not depriving it of its validity in our usual dealings with nature, allows for a certain measure of external indetermination in the individual units composing the statistical aggregate. If the determination of any large-scale event depends on the action of one or a few smaller component units, which, individually considered, are subject to small-scale determination, the event ceases to be predictable or deterministic in the former mechanistic sense. This kind of condition apparently corresponds to the one actually existing in living organisms.[4]

All experience indicates that events can occur and possess constant or predictable characteristics, or even existence, only if certain invariant controlling factors are present. This is a first principle of experimental science. Thus physics assumes invariance in the energy-content of an isolated system, or in the general geometrical conditions determining the spatio-temporal relations between events. But the particularity of any natural event seems never to be completely determined by the immediate conditions under which it occurs, although in simple physical events the determination may appear to approach very closely to completeness. In more complex cases we find that a variety of different events may occur under conditions which are experimentally kept as constant as possible. This is true even of a relatively simple process like Brownian movement. Apparently it is not sufficient to establish or render constant the conditions necessary for any event in order to ensure that event and that event only; i.e., the conditioning of an event is to be distinguished from its complete determination (a distinction not always made); more than one event may occur under the same conditions.[5]

[3] *Cf.* the recent paper of Alfred Stock, "The Present State of the Physical Sciences," in *Science*, April 1, 1932, Vol. LXXV, p. 345.

[4] R. S. Lillie, *Science*, 1927, Vol. LXVI, p. 139.

[5] *Cf.* the recent paper of Professor Percy Hughes, "Forms of Generalization and their Causes," this JOURNAL, 1930, Vol. XXVII, p. 281.

This would imply that in any single natural occurrence an element of spontaneity or novelty is always present, conjoined inseparably with the necessary element of order, constancy, or stability. The typical experience is that any event when scrutinized closely shows a combination of constant and variable factors. When we make any physical deduction we assume that at least the general characteristics of the space-time order remain invariant throughout the phenomenon under consideration; yet any single electron event shows a variability that apparently is to be ascribed only to inner conditions, since we find that fixing the external conditions does not assure complete constancy. Thus every physical event appears to have within itself an element, greater or less, of arbitrariness or freedom from fixed rule. It is a matter of indifference whether we characterize this general condition verbally as indeterminateness, or as contingency, or as determination not referable to outside causes. It may be defined as that part of the individuality of the event which expresses its inner spontaneity.

This brings us to the consideration of directive influence. Is there an *inner* directive influence in atomic phenomena,[6] as distinguished from the directive influence which one physical unit demonstrably exercises upon another or others external to it? The experimental evidence indicates the existence of such influence, although the factors appear to be beyond the possibility of external (i.e., physical) observation at present. A radium atom emits electrons and alpha particles at intervals (long for the individual atom[7]), without regard to the external conditions. The determination of each such event is internal; the kinetic energy of the emitted particle comes from the transformed inner energy of the atom. This intra-atomic energy is enormously large; how it came to be so concentrated is unknown; but on any evolutionary interpretation of nature some process is implied by which energy has been centralized in an indefinitely large plurality of discrete units or entities each with a certain independence or autonomy of its own. These units appear in the spatio-temporal scheme of science as atoms and electrons, stable physical centres of action, formerly considered indestructible. In this sense physical science is in formal agreement with the monadic conceptions of Leibniz and his successors. Physical science, however, views atomic phenomena from outside and has nothing to say with regard to any possible intrinsic (e.g., psychic)

[6] I.e., an influence originating intra-atomically and determining unequivocally the spatial direction and the time of transfer of an impulse to action (e.g., a quantum of energy) from one particular atom to another.

[7] Of the order of some hundred years on the average, as given by the ratio between the number of atoms in a given mass of radium and the number of particles which it emits in a given time.

quality or "inner life" possessed by the ultimate units. Granting that this inner quality exists, the only physical evidence of it would be some influence exerted on other physical units, also externally observed, a process involving the interchange of energy units or quanta.[8] The inner energy of the atom, as radioactivity shows, may express itself externally (if at all) only at intervals and under certain physically unknown conditions. What is happening inside the atom in these intervals? We may point to the inner life of human beings as an analogy; but at present the kind of consciousness associated with a complex living organism, as each man experiences it in himself, can not be derived by any plausible hypothesis from the summation of a supposed inner life of atoms. Nevertheless the external indeterminateness of voluntary action and the innate variability of individual atomic or electronic phenomena are facts which would appear to have a common basis. Apparently a certain inner spontaneity or externally unconditioned activity is a feature or property common to all individualized natural entities. Again we recognize the conjunction of permanent or stable (law-abiding) factors with spontaneous, originative or individual (non-repetitive) factors as a fundamental characteristic of natural reality.

It is evident that any single directive influence is asymmetrical, also that statistical symmetry is perfectly compatible with asymmetry in the action of units. The action of molecules in a gas at equilibrium is statistically symmetrical. If we compress the gas we introduce temporarily an asymmetric influence. During the compression there is a preponderant motion of molecules in one direction, toward the interior; at equilibrium symmetry is restored, and there is no further progressive change. Asymmetric action, i.e., action in a certain definite direction at a certain definite time, is involved in any physical change.[9] Randomness is a characteristic of non-guided atomic motion; during any time interval (not too small) events happen equally and impartially in all directions without choice or selectiveness; the mathematical treatment of the laws of energy, especially the second law, presupposes such randomness. But in

[8] This is well stated in a recent address by Sir Arthur Eddington, "The Decline of Determinism," published in *Nature* of February 13, 1932, CXXIX, 233: "Whenever we state the properties of a body in terms of physical quantities, we are imparting knowledge as to the response of various external indicators to its presence and nothing more. A knowledge of the response of all kinds of objects would determine completely its relation to its environment, leaving only its un-get-atable inner nature which is outside the scope of physics. Thus if the system is really isolated so that it has no interaction with its surroundings, it has no properties belonging to physics, but only an inner nature which is beyond physics" (p. 239).

[9] *Cf.* Pierre Curie: "A phenomenon can only occur or even be propagated if a dissymmetry exists." (Quoted in C. E. Guye's *Physico-chemical Evolution*, New York, E. P. Dutton & Co., p. 163.)

nature, considered as a whole, there is a definite preponderance of asymmetric action; the fact of evolution is sufficient evidence of this. This asymmetry implies (physically) the concerted action of many atomic units, i.e., a general directive influence of some kind, exerted on a large scale. We may infer that without directive action nature would be homogeneous, or at least its components would be uniformly distributed.

A summarized statement of the general physical conditions prevailing in the cosmos might run as follows. We observe that, although all space is pervaded by radiant energy, coming from all directions, local concentrations of energy, protons and electrons, sparingly distributed, form the greater part of the physical world. Typically these form large atomic aggregates or material systems. The origin of these concentrations is unknown, but it is clear that each unit as well as each aggregate represents a localized directive or asymmetrical action of some kind. Directive action would thus seem to be fundamental in physical nature; and apparently it is intensified, or reaches a maximum, in those natural systems which we distinguish as living organisms. These form a relatively small part of the cosmic material; they are special centers of growth and chemical activity, self-perpetuating systems, characterized by a unique complexity of structure and behavior, and evidently representing the products of a long continued evolution.

In living organisms the experimental evidence of asymmetric action, having its point of application in the individual molecules, is quite definite and familiar to all biologists. Discrimination between right-handed and left-handed asymmetrical molecules is a basic feature of metabolism, both in animals and plants. The proteins are complexes of asymmetrical amino-acids; each protein molecule thus exhibits within its own small volume a high degree of structural diversity. This diversity forms the basis of specificity,[10] with all that this implies with regard to the structural and physiological differences between the species of animals and plants. Structural asymmetry presupposes a corresponding asymmetry in the ultimate structure-forming processes, i.e., in the chemical reactions by which the biochemical compounds are built up from the materials of the environment. These materials may be simple compounds uniformly distributed and showing no molecular asymmetry, as in the case of plants; the source of the asymmetry is thus internal, within the organism itself. This kind of selectiveness or asymmetrical choice in chemical reactions is peculiar to living organisms or to the products of their activity; at least we have no certain knowledge of its exist-

[10] This is the view of most biologists; for a summary of the evidence *cf.* (e.g.) Jacques Loeb's *Organism as a Whole*, New York, G. P. Putnam's Sons (1916), Chap. 3, "The Chemical Basis of Genus and Species."

ence elsewhere in nature. We come here to a long recognized distinction between living and non-living systems. In the year 1860, Pasteur refers to "the molecular asymmetry of natural organic products as the great characteristic which establishes perhaps the only well-marked line of demarcation that can at present be drawn between the chemistry of dead matter and that of living matter." This subject is discussed in the well-known address of Professor F. R. Japp before the British Association in 1898,[11] in which he sums up his own final conclusions as follows: "at the moment when life first arose a directive force came into place, a force of precisely the same character as that which enables the intelligent operator by the exercise of his will to select one crystallized enantiomorph and to reject its asymmetric opposite." This statement has been widely interpreted as making a stand for a vitalistic as distinguished from a purely physico-chemical interpretation of vital phenomena, and it aroused much interest at the time.[12]

What is here interesting is that a small-scale directive activity, expressing itself in the behavior of single molecules, is postulated as the basis of both selective metabolic action and acts of will. The uniform or symmetrical distribution of single atomic actions, which would result from purely chance conditions, is replaced by an activity having a definite asymmetric trend. This asymmetry can not be referred (at least ultimately) to external conditions. Its source would thus be intra-molecular or intra-atomic; this would place it in a similar category with the conditions determining the emission of electrons at intervals from a radioactive atom; each electron or α-particle is emitted in a definite direction, and the emission is uninfluenced by external conditions.[13]

It is, in fact, well recognized in physical chemistry that individual molecules in a molar aggregate, or even microscopically visible particles as in Brownian movement, may, during a short space of time, show asymmetric activity. Symmetry appears only when large numbers and large times are considered; that is, it is statistical symmetry. The observations on Brownian movement show that a small group of particles (similar to large molecules in their order of size) may give rise, under constant external conditions, to an indefinitely large

[11] F. R. Japp, "Stereochemistry and Vitalism," *Nature* (1898), CVIII, 452; he cites Pasteur as above.

[12] It was followed by an active correspondence in the columns of *Nature*, in which Herbert Spencer, Karl Pearson, and other well-known scientific men took part.

[13] Some qualification may be needed here because of the recent experimental work from Rutherford's laboratory showing the possibility of atomic transformation by bombardment with α-particles at high voltage. Intra-atomic factors would appear to be not entirely exempt, under all conditions, from external interference.

number of groupings or configurations which at times may have a high degree of asymmetry. The determination of the precise configuration existing at any given time is not to be accounted for by general principles such as the laws of thermodynamics, which expressly rule from consideration the special actions of individual molecules. A selective or asymmetric distribution may occur, at least temporarily, without infringing these conditions. This fact may (from one point of view) be regarded as an exemplification of the philosophical rule that particularity (=individuality) is not amenable to general principle or classification except in part. Its tendency is to escape restrictions, such as those imposed by conditions established in past time. The non-amenable residuum represents the field within which physical indeterminism or absence of external determination may exist. Hence at each station attained in evolution a certain freedom exists for future development. But what it is important to note, in relation to the present subject of discussion, is that only the microscopic or sub-microscopic elements of matter can have their motion thus controlled unequivocally by internal as distinguished from external conditions. In this "small-scale" field we have experimental evidence of an externally indeterminate distribution of activity or influence; and it is conceivable that influences of this type, made persistent and directive (instead of temporary and random) through some special feature of vital organization, may control the special arrangement adopted by certain groups of molecules or protoplasmic particles and hence determine the detailed course of the metabolic process. The predominance of asymmetric syntheses in living matter is one expression of a directive influence of this kind, and may be taken as an illustration of the importance of small-scale action in living organisms.

I am aware that the asymmetry of the organic syntheses in living matter is referred, scientifically, to the asymmetry of the conditions under which the reactions occur. Among these conditions are the presence of other asymmetric molecules, asymmetric catalyzers and asymmetric structural conditions. The polyphasic structure of colloidal systems and the presence of electrically polarized surfaces or membranes are additional factors making for asymmetry. In general we may say that the building up of any complex structure presupposes the presence of asymmetric conditions during its formation; as Japp points out, asymmetry once established can beget asymmetry. But all the special conditions at present existing in the various forms of living matter have an evolutionary background; and one can only speculate as to the original conditions determining the choice between two enantiomorphs. As physical or external factors have been suggested the conditions of radiation, the action of polarized light (e.g., of moonlight), even the asymmetry of the earth's motion (west to

east, not east to west). In any case the reference is always to some pre-existing asymmetry and an infinite regress is implied. The ultimate problem becomes again the problem of why nature is not homogeneous.

It is interesting to note at this point that certain of the early materialists, including Lucretius, thought it necessary to ascribe a certain measure of indeterminacy to atomic motion, apparently in order to reconcile a mechanistic conception of nature with the fact of free will. This has been pointed out quite recently by Professor d'Arcy Thompson;[14] and we may compare the slight swerving of the atoms from a mechanically predetermined path ("exiguum clinamen") as postulated by Lucretius,[15] to the possible range of physical indeterminacy as defined by the Heisenberg principle. There is a certain irony in the fact that the assignment of fixed limits to the unequivocal mechanical determination of events has only recently received its final justification at the hands of experimental physics itself.

But the absence or subordination of mechanical determination (in the formerly accepted sense) in single atoms does not mean the absence of any kind of determination. The problem is rather as to the nature of the inner determination to be assumed, and as to whether we are in position to define it in any clear and scientifically acceptable terms. We may agree that the classical or mass-action types of determination represented by large-scale physics and the greater part of physical chemistry are insufficient to account for the special kind of organization and activity exhibited by living matter, and that a reference to small-scale determination is required; but how are we to conceive this latter type and its mode of operation?

Biology has consistently attempted to solve its problems, especially its basic problem of individual development, by reference to smaller and smaller elements of structure. From chromosomes and genes we pass by successive stages to single molecules; thus in biological specificity the special complexity of protein molecules is regarded as determinative, and immunological reactions show that definite physio-

[14] *Nature* (1928), CXXI, 565. He remarks on "a strange point of the Lucretian doctrine, that 'exiguum clinamen' by which the atoms swerve ever so little, and only now and then, from the straight determined path and so are brought into collision, which collisions are the starting point of a new order of things. Thus a certain freedom of action is possessed even by the atom, and is the first faint adumbration of our own soul's free will—'unde haec est nobis innata potestas.' Here Lucretius qualifies the more relentless materialism of Democritus. . . . It reminds us of Newton's famous scholium: 'a caeca necessitate, quae eadem est semper et ubigue, nulla oritur rerum variatio.'"

There is an echo of this in C. S. Peirce: "mechanical law can never produce diversification." (*Cf. Collected Papers*, edited by Hartshorne and Weiss, Harvard University Press, Vol. I (1931), paragraph 174.)

[15] *De Rerum Natura*, Book 2, line 292.

logical characters may be bound up with the special configuration of these molecules. In all such procedure there is implied an ultimate reference to factors determining the action of single molecules, and hence to the conditions determining the transfer of electrons from molecule to molecule; in the last analysis directive internal factors in the atoms themselves must be assumed. But since the intra-atomic processes are not open to external observation, physical analysis is arrested at this point and experimental method would seem to be at a loss.

Can we gain light on our problem indirectly by a consideration of the general features of conscious or psychical processes, i.e., processes observable introspectively, but not externally? Selectivity or discrimination, combined with unification or synthesis, would seem to be the most general characteristics of the mental or psychical as such; and the directive and unifying property seen in the vital processes (as viewed objectively) may seem to have its counterpart here. But such considerations are vague and can scarcely be called scientific at present.

A question more open to scientific approach is the following. How can the inner factors of large numbers of atoms be combined, unified, or synchronized in such manner as to determine external directive action on a large scale, such as that shown by animals in their normal activities? This question is related to the one raised by Eddington with regard to "key atoms."[16] As I pointed out in a preceding paper,[17] a single molecule may conceivably originate large scale action through processes of transmission combined with amplification, of the same general kind as that shown in the various forms of protoplasmic response, including the nervous. But this is a simple spreading effect, of which the most familiar example is an explosion originating in a spark, and by itself is scarcely sufficient, since what is involved in any act of directive behavior in higher animals is not merely the action of single transmissive units, but the combined activity of organized groups of cells, especially nerve cells. Groups of associated cells can, however, be conceived as working in unison under the influence of a transmitted influence of the electric type; in fact, instances of this kind are well known to biologists.[18] These, however, are large-scale effects. The question is, can a directive influence, originating intra-atomically, be assumed to affect a relatively large number of molecules, and then secondarily, through the intermediary of these reacting molecules, larger groups of nerve

[16] *Nature of the Physical World*, p. 313.

[17] This JOURNAL, 1931, Vol. XXVIII, p. 561.

[18] Groups of independent motile cells, such as spermatozoa, may show synchronous action under certain conditions. *Cf.* my volume, *Protoplasmic Action and Nervous Action*, University of Chicago Press (1923), p. 392, for further details and discussion.

cells having definitely organized structural and physiological relationships? Apparently groups of atoms acting in concert would have to be assumed as the initiatory factors in such a sequence. The ultimate determination would then be referred to special intra-atomic conditions, and a transmission of influence between neighboring atoms would be required.

In the face of such a problem we may have to abandon physical models of the usual visual type, and conceive the constant or scientifically definable relations, especially with regard to the initiatory intra-atomic action, in some quite different manner. This, in fact, is now being done in physics; mathematical expressions having no recognizable application in our concrete experience (like the square root of minus one) may have a definite representative value in the relativistic treatment of quantum phenomena or thermodynamics.[19] It should also be remembered that a peculiarity of vital phenomena in their higher development is that both objective and introspective means of observation are available. What is lacking in the one type of observation may be supplied by the other type; i.e., physiology may be supplemented by psychology. The need of proceeding critically is, of course, always to be insisted upon. This can be done, at least up to a certain point, without recourse to mysticism or dispensing with scientific rigor. A primary problem in physiological analysis is to determine which vital characters are to be referred to the large-scale types of physical determination (mechanical or statistical determination), and which to the small-scale types (intra-atomic or individual quantum determination). Evidently any directive action originating intra-atomically and acting in or between single molecules must be referred to the latter class; and this action appears to have characters not representable by models drawn from our experience of the external world.

The general problem of the mind-body relationship enters at this point. Eddington raises the question whether the mind acts on the body through the agency of one or two "key atoms" which control the behavior of a multitude of other atoms, and he concludes that this is not possible unless the "mind" has the power to set aside the statistical laws of thermodynamics. This possibility he seems to regard with doubt, and yet not entirely to reject. Instead of the usual unorganized behavior of the large atomic group, acting in accordance with statistical rules—each atom preserving its independence as assumed in statistical theory—he supposes that in living organisms there may be some kind of interdependence of the individual atomic actions which is not present in inorganic matter. He speaks of "the broader unifying trends of the mind-stuff," and "some kind of physi-

[19] *Cf.* the recent address of Professor R. C. Tolman, "Models of the Physical Universe," *Science*, April 8, 1932, LXXV, 367.

cal substitute for the Ego." The unification required by the facts of individual or personal control is here conceived after the analogy of mental unification. This, however, is a statement of the problem rather than a solution. The possibility of a directive action controlled inwardly or intra-atomically is assumed, and this action is regarded as dominating in some unknown way the whole large-scale organism. The single atom may be "free," but not the multitude of atoms. In the latter case the statistical summation, assuming it to occur in the usual symmetrical manner, would annul any possible directive action.[20]

Is there any scientific way of evading this difficulty? In physical chemistry a unified or synchronous action affecting large numbers of atoms and molecules may be obtained experimentally through electrical influence. This kind of physical influence, together with radiation, is the characteristic form of "distance action" in nature. For example, all of the molecules at the surface of an electrode are affected simultaneously and similarly when a current passes through an electrolytic cell or battery. In view of the dependence of nervous stimulation and transmission upon electrical conditions, this possibility is one to be considered. The "key atoms" may, by altering local electrical conditions, e.g., by giving rise to local currents at the electrode-like surfaces of the living protoplasm, be the means of activating indirectly a large area.[20a] These large-scale effects would be produced through the intermediary of amplifying and relay arrangements, in which the necessary transmissions would be of the spreading or protoplasmic (nervous) type; such transmissions apparently depend on the formation of local bioelectric circuits. Transmitted influences of this general kind would be selective or directive in their final incidence if the initiating atomic action were directive. The precise effect produced on the whole organism would depend

[20] Eddington: *Nature of the Physical World*, pp. 313 ff.; *cf.* also "The Decline of Determinism," *Nature, loc. cit.*, p. 240.

[20a] If the key atoms, whose activation initiates stimulation, are situated at a surface having the properties of an electrode surface, all will be affected alike by the passage of an electric current across the surface. According to modern physiological conceptions, the semi-permeable membranes of the irritable elements are the site of the electrically sensitive key reactions of stimulation; and transmission consists in waves of electrochemical change passing along such membranes. It is therefore consistent with physiology to assume that groups of similar molecules similarly oriented at the surface of a protoplasmic membrane are the groups first affected by any stimulating agent, e.g., by an electrical influence sufficiently intense to overpass the threshold. The key atoms would occupy definite positions in such molecules. Similarly, a sufficient change in one key atom would initiate a transmitted effect because of the accompanying electrical effect on other similarly situated atoms. A physiological basis for unificaiton of activity is thus conceivable, having characters representable by a model of this type.

upon the direction in which the quantum transfers in the "key atoms" were effected. We should have to assume a dichotomy at certain points in the irritable and conducting structure, permitting alternative directions of action at these points. A further requirement, already mentioned, would be the unification or summation of a large number of single atomic actions; this is a necessary condition for the intensification of the local initiatory effect, and apparently could be effected by electrical means, as above indicated. Whatever conditions are assumed, it is evident that they must be consonant with the facts of physiology. We have definite physiological evidence (e.g., in vision) that a stimulation or activation involving only a few elements may fail to reach the level of affecting consciousness, while if a few more elements are activated (i.e., if the "threshold" is overpassed) a definite sensation involving physiological response follows.

In general, the hypothesis here outlined would refer the ultimate directive action to intra-atomic influence, this influence being transmitted and amplified, under the special structural conditions prevailing in the neuromotor system, in such a way as to control the large-scale action of the whole organism. The precise details of a sequence need not concern us at present; they are, in fact, a subject of speculation and not of scientific knowledge. The fundamental condition required for making such control possible would be the presence of a constant correlation between the intra-atomic processes and the effects produced externally by these processes. The physical evidence indicates that intra-atomic activity needs not be manifested externally (i.e., in a physically appreciable way) except at intervals; the example of the radium atom illustrates this. Yet the high energy-content of the atom indicates the existence of a continual inner activity or inner tension; we also know that this energy, under the appropriate conditions, may assert itself externally, i.e., physically. In the transmission of physical influence units of action (quanta) are transferred from atom to atom; the vital directive activity would consist in controlling the time and direction of this transfer.

Some of the more general implications of the present discussion may now be briefly indicated. The physical analysis leading to atomism has its philosophical counterpart or analogy in monadism. Each physical fact or unit has its own peculiar quality of self-assertiveness, unequivocality, or individual uniqueness, also its own capacity to influence, or be influenced by, other units. Isolation (= persistent individuality) or inwardness, and also some capability of interaction, implying the possibility of innerconnectedness and intercommunication, thus appear to be fundamental characteristics of the ultimate natural units, as well as of the larger aggregates which they compose. Briefly, we have on the one hand the insula-

tion of units, and on the other hand the responsiveness of each unit to influences exerted by others; these two conditions from the necessary foundation or prerequisite for definite or regular action of any kind. Insulation corresponds to self-hood, in that it involves the possession of a certain inalienable or persistent inner character or quality. To this insulation corresponds physically the large internal energy of each atomic unit. In the transmission of influence between atomic units (according to the prevailing conceptions of physical causation) one or more quanta disappear from one unit and simultaneously reappear in another or others. The energy thus transferred is insignificant in quantity compared with the total energy of the unit; that is, one atom influences another without undergoing essential change in its own internal nature.

This insulation of the atomic units, each with its large store of internal tension or energy, is a fact to be accepted and not explained at the present time. Physical methods of investigation fail us here. It seems clear, however, that unless each element of nature possessed the property of remaining unalterably itself, unaffected in its essential inner nature by external events, any definite action or regularity of occurrence would not be possible. The inner stability of the atom furnishes the element of constancy or permanent order required for the exhibition of its fixed or characteristic modes of activity. In other words, it represents the constancy of condition under which a certain range of freedom or externally undetermined activity becomes possible.

It is evident that the scientific conception of nature as composed of discrete or individualized elementary units, and of natural action as dependent on the preservation by each unit of its characteristic identity, offers a close correspondence, at least in form, with the monadic conceptions of Leibniz.[21] Although the theory of monads is not in itself a physical theory, its main contentions and its logical consequences, if it is true, should conform to physical fact. Physical science, however, departs widely from Leibniz's theory in one important respect. Its results seem definitely inconsistent with the conception of a "pre-established harmony," or any other kind of closed universe, since this would imply complete determinateness in the interaction of units. The element of variability or partial indeterminateness appears to be innate in atomic behavior; and we may attribute this character to inner factors having a certain primordial autonomy or freedom from external influence. The conditions

[21] The affinities between the theory of monads and the modern scientific view of nature are discussed in an illuminating manner in Professor Wildon Carr's recent edition of the Monadology (*The Monadology of Leibniz*, Favil Press, London, 1930).

required for a genuinely novel and at present undetermined future order of events would thus seem to be inherent in natural reality.

In the world of classical physics it is assumed that any portion of nature which is isolated reaches sooner or later a state in which it remains permanently unchanged. Such a system is shielded against outside influence, i.e., against any factors of change which originate outside of itself, and its determination then becomes purely internal. If it had no inner spontaneity it would tend toward permanent equilibrium.[22] It is of interest to note that living organisms, while maintaining themselves through interchange with their environment, exhibit at the same time a high degree of insulation against that environment, as shown by their various protective structures and activities. Associated with this insulation is a unique development of internal determination or spontaneity. Hitherto in biology we have aimed chiefly at explaining these and other vital characteristics on the basis of the externalism of classical physics, but this now appears to be insufficient. Intra-atomic factors of determination are to be regarded as primary and fundamental.

Science now recognizes more clearly than before the necessarily incomplete character of any philosophy of nature based solely on the observed and calculated features of the external world. Results gained by external perception, the observational side of natural science, give only indirect evidence of the nature of extra-perceptual reality, although quantitatively considered (i.e., in terms of total energy-content) this is the largest part. The perceptual apprehension of any object (e.g., by vision) gives its position, its movements, its interactions with other objects; the small fraction of transferred energy reaching the observer's sense-organs furnishes sufficient indicia for this. But the relatively large intra-atomic energy is not manifested externally except indirectly and intermittently, and under conditions physically unknown at present. It is in this field that the spontaneous or originative capacity of nature, so largely developed or centralized in living organisms, is chiefly to be sought.

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[22] In a recent paper by the physicist, Dr. P. Jordan of Göttingen, "Philosophical Foundations of Quantum Theory" (translated in *Nature*, 1927, Vol. 119, p. 566), he discusses physical causality as illustrated by the behavior of atoms in an isolated space (closed "box"). For the unique determination of conditions inside the box he says expressly: "We should have to exclude the case that there is a living organism inside the box; . . . the notion of determinism must be formulated differently for biology and physics."

THE ANALYSIS OF THE SUBJECT-PREDICATE PROPOSITION

THE common opinion is that a sentence like "This pen is blue" expresses a SP proposition.[1] But the meaning is really a conjunction of two propositions, viz., *This is a pen* and *This is blue*, because it is their truth-function.[2]

It will generally be agreed that *This is blue*, the simpler of the components, is a SP proposition, in which the demonstrative symbol "this" stands for a particular, the adjective "blue" for a character, and the tie "is" for a connectedness between the particular and the character, which is either entailed by or identical with the relation of characterizing.[3] Different interpretations arise when one attempts to explain *how* the symbol "this" functions in relation to the particular. There are two main alternatives. According to the first the particular exists *outside* the proposition so that the symbol "this" merely *refers* to it. The reference in its turn is interpreted in two ways. One of these is the assertion that the symbol "this" has only the significance of referring to a particular without actually referring to anything unless supplemented by the predicate which describes the particular. In other words, the subject only indicates that the reference is present, the reference itself is realized by the complete proposition: "its reference *is* description." This is Professor Loewenberg's analysis, but he himself shows the embarrassing consequence to which it leads: "either (a) the only reference of judgment is to what it itself describes . . . , [in which case] there can never be any *false* judgment . . . , or (b) its reference is

[1] The shorthand symbol SP will be used for "subject-predicate." Propositions such as (1) *All (some) pens are blue* and (2) *The (a) pen is blue* only appear to be SP propositions because of their verbal expression. The particular propositions are conjunctions of two propositional functions prefixed by the phrase "there is an x such that . . . ," while the universal propositions are denials of such conjunctions. The propositions of the second group being concerned with definite or indefinite descriptions, likewise involve propositional functions.

[2] In a footnote to his interesting article, "The Metaphysics and Logic on Classes," Professor P. Weiss attempts to deal with *This book is red* on the assumption that it is a simple SP proposition and it is this that leads him to unnecessary complications. *The Monist*, Jan., 1932, p. 119.

[3] It should be noted that even *This is blue* may not be a simple SP proposition if Professor C. H. Langford is right that it means *This is of some determinate shade of blue*. I propose, however, to deal with *This is blue* as if *blue* were a name of a specific shade. To dispense with any doubt the reader may substitute *This is black* for *This is blue*. It is true that even *This is black* entails *This is of some extension*, but this merely means that the first proposition is an abstraction from the actual situation. As an abstraction it is not indeterminate, since the specific shade concerned need not depend on any specific extension. C. H. Langford, "General Propositions," *Mind*, Oct., 1930.

to something else not described by it . . . [and then] there can never be any *true* judgment." Now the conflict between the conclusion of the dilemma and the fact that there are true and false SP propositions is in itself a refutation of the analysis.[4] Another decisive objection is that the same predicate is attributable to different particulars and so does not indicate, by description, one thing to the exclusion of others. The second interpretation of reference likens the demonstrative symbol to a gesture or signal, such as an arrow, so that a more striking way to express *this is blue* would be "← is blue." But this expression is obviously not a proposition at all unless it were taken together with the particular to which the arrow is known to point. Then there would be an additional proposition to the effect that *This (particular) is being indicated by the arrow.* That the additional proposition contains the particular should be recognized in order to avoid an infinite regress. But then there is no reason to believe that the symbol "this" functions differently in the original proposition. And so the second main alternative is that the particular is a constituent of the proposition *This is blue.*

The particular-constituent must be capable of being completely exhibited in a single SP proposition, since otherwise the proposition would have to refer to something beyond itself. This excludes events or continuants (if there are any) because they as a rule occupy too much space and time to be objects of immediate intuition and therefore of a single proposition. The sense-data form an exception, for by definition they are events displayed in the field of immediate perception. But sense-data fail as subjects of SP propositions in at least the following respects.

1. Some particulars properly designated by the demonstrative symbol can not be perceived through the senses at all, viz., emotions, wishes, etc.[5] Even sensations are not always definite and clear-cut sense-data. To illustrate, consider *This is blue* when it is about the sky.

2. A sense-datum is the private property of the percipient. Hence if it were a part of a SP proposition, the latter would be incommunicable.

3. If "this" were to stand for a sense-datum, the structures of *This is blue* and *This is a pen* would be decidedly different in spite of the similarity of the sentences. The first proposition would be an analysis of the particular, since the subject is related to the predi-

[4] I take it for granted that the dilemma follows from the analysis. Mr. Gotshalk attempted to deny it, but Professor Loewenberg easily disposed of his arguments. This JOURNAL, Vol. XXVII, p. 544 ff.

[5] Even characters, relations, and propositions, in spite of being universals, are "particular in the sense of each being just what it is and distinct from others. As such they are designated by demonstrative symbols.

cate as the whole to a part. The corresponding terms of the second proposition are related as a part to the whole; hence its real meaning is some such proposition as *This is a manifestation of a pen,* which (when expressed symbolically) is seen to be obviously a compound proposition.

4. A sentence of the type "This is blue" is not usually employed to express analysis. At any rate the same sentence is most often used whenever one wishes to express the relation of characterizing. And then the demonstrative symbol does not stand for the whole sense-datum, because the complex nature of the latter can not be characterized by a simple adjective such as "blue." The contention that the relation of characterizing is merely analysis is untenable: it implies that there are no false SP propositions; for in analyzing the subject, a determinate sense-datum, one can not select for predication any determinate adjective which is not there.

The source of all these difficulties is the identification of the particular with the sense-datum which is something taken *together* with all its characters. The remedy is in interpreting the particular as something *apart* from its character, i.e., as the residue which is left when one abstracts the nature from an entity. On this interpretation: (*a*) the SP proposition obviously would express the relation of characterizing; (*b*) the propositions *This is blue* and *This is a pen* would differ only in so far as "pen," unlike "blue," is a complex description; (*c*) there would be SP propositions not only about sense-data, but also about other events and, in fact, about anything having particularity; (*d*) there could be false SP propositions, because anything can be predicated about the subject whose nature is not disclosed. According to this conception the reality of particulars is proved by considering that several events may be exactly alike and yet distinct. The "otherness" of events is their "particularity."

The proposed analysis gives additional evidence in favor of taking the predicate to be a universal.[6] For the subject takes care of whatever is particular in the fact expressed by the SP proposition. Accordingly there is no need to hold (as certain logicians do) that the

[6] To the various objections against the nominalists I wish to add the following. It is a fact of personal experience that in the field of immediate perception there are two entities exactly alike in nature, e.g., two two-cent stamps. That under closer inspection one might detect some difference does not undermine the fact that in the original experience no difference was found. It is important to emphasize that only data exactly similar would prove the reality of universals. Partial similarity (contrary to a common opinion) does not imply that there are universals in respect of which the things are similar: the determinates under the same determinable may be of different degrees of similarity without having any property in common.

predicate stands for an instance of a universal and not for the universal itself; nor is it plausible to deny the reality of universals altogether.

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BOOK REVIEWS

Introduction to Philosophical Analysis. JAMES BURNHAM and PHILIP WHEELWRIGHT. New York: Henry Holt & Co. 1932. Pp. 462.

Here is a philosophy book written in the spirit of modernity—a book with an unacademic, metropolitan atmosphere; alive, rapid, colloquial. Since it has, quite characteristically, no preface, the reader can only guess at the purpose it is meant to serve, and by all outward symptoms it appears to be intended for use in introductory college courses. The subdivided chapters, occasional paragraph-headings and business-like exposition leave it none of the essay-like qualities which are supposed to appeal to an anomalous person called "the general reader," and the absence of original or controversial matter removes it from the class of professional contributions, but both of these characteristics make it desirable for elementary study. *Ergo,* it is a textbook.

Certainly our students need a book of this sort, which begins with methodological considerations, calls attention to dangerous fallacies such as bad definition, hypostatization of concepts, misleading analogies, fantastic images and ideologies, and then proceeds to illustrate *correct* philosophic method by treating actual problems of philosophy. The method of philosophical analysis has much to recommend it, although its protagonists sometimes fail to realize that a strict use of logic in philosophy does not entail a method wholly, or even predominantly, analytic. *Analysis* of our common-sense ideas usually serves only to show that they have no consistent structure; philosophy, therefore, is essentially a work of logical building—not an analysis, but a reconstruction of our ideas of things. Fortunately, the procedure of the book makes this clear to anyone who would discern it, and the title, which perpetuates the superstition that all rational thinking is analytic, in this respect belies the content.

The approach which the two authors have taken merits the whole-hearted approval of anyone who believes that philosophy is a systematic pursuit, to be studied step by step, not in a tantalizing jumble; but the way they have carried out their campaign raises another question. The task they have set themselves is a great and difficult one, and the execution, on the whole, falls short of the ex-

cellent conception. The value of a book which makes no original contribution to knowledge must lie in the clarity, accuracy, and strict sequence with which it presents old ideas to new initiates; a textbook must be, above all, well-thought and well-wrought. It should omit all ideas which are not relevant to the argument at the point of development which it has reached. The student is prone enough, anyway, to wander off on byways of free association. If we illustrate our general statements with examples which can not have meanings more distinct and familiar to the reader than the ideas they illustrate, we only invite him to fill his mind with silly images he takes for "examples." Thus, a cursory mention of "the so-called FitzGerald contraction, a theory which was formerly used to explain certain anomalies in physics," can hardly serve a college undergraduate as an example of anything, even though he may have met the term "FitzGerald contraction" before—especially as this same student is later (in Ch. 7) given a tediously elementary account of classical physics from which we must infer that he is not expected to know even the Newtonian conceptions of matter. Throughout the book one finds a tendency to talk about things the authors can not undertake to clarify. It might be argued, of course, that this serves to stimulate the student's curiosity; but it is far more likely to flatter him into thinking that he knows enough to read the book. There is an unfortunate tendency in our educational system to fill people's minds with catchwords, and flatter them into believing that because they have often heard about Relativity or Evolution on non-Euclidean Geometry, they have some knowledge of these subjects. This "catch-word fallacy," as it might be termed, is very apparent here. For instance, on pp. 287–288 we are told that "the more exact stage in the study of evolution was begun in the late nineteenth century when Hugo De Vries revived controlled experiments such as had been made some use of by Lamarck and Mendel. Considerable specific modification has been brought about under conditions admitting a good deal of precision." Undoubtedly the authors know to what experiments they are referring, and of what nature the modifications were; but when they ask, in the very next sentence, "How much does this evidence prove?" a careful student can only reply that he has not read any evidence, and a less astute soul will happily let the "evidence" prove that the amoeba tends toward God.

To systematize a field like philosophy is a Herculean task, and to perform it the authors would have had to be entirely free from such considerations as the demands of conventional teaching-programmes. But, after all, the book is written to meet just such demands, and conscientiously mentions every topic an introductory

course might be expected to touch upon—symbolic logic, space-time, psycho-analysis, and what-not. For instance, on p. 220 the authors profess to make "a brief and vague attempt" to tell us about contemporary physics; what on earth is the use of a brief and vague attempt at expounding a subject essentially profound, systematic and exacting? None, but to satisfy a misguided educational ideal, a foolish demand. Furthermore, no other motive could account for the inclusion of one chapter on the symbolic notation for propositions and their inter-relations; for the cursory account here given is necessarily difficult and jumbled, and, what is most disconcerting, *symbolic logic is not needed for understanding the subsequent parts of the book.* On p. 150 the relation $a \equiv b$ is mentioned, but unfortunately in an erroneous way, since a is said to precede b in time, so that a and b can not be propositions—and only propositions can be mutually implied, or equivalent. The spirit of symbolic logic has not found its way into the book; else how could we possibly be told, on p. 212, that a proposition of physics was *necessarily true* "for a time"?

Only two notions derived from modern logic figure prominently in the book: they are the notions of the Universe of Discourse, and of Postulates. But they are not used in a way familiar to logicians. "Universe of Discourse" usually means a *context,* as in Chapter X, where the word "Universe" has been replaced by "Realm"—at least, we are not told that "Realm of Discourse" has a different meaning from "Universe of Discourse." Now, a logical Universe is not a realm of phenomena; it is a set of basic concepts. The fact that a set of concepts is applied to an arbitrarily limited realm of phenomena does not make this set constitute a Universe of Discourse; still less does it make the *phenomena* compose a logical Universe. This is an elementary and unpardonable confusion. A similar error occurs on p. 408, where we learn that "factual beliefs do not clash when they belong strictly to different realms of discourse." This is a popular argument, often heard from the pulpit by intellectual congregations, but it should no longer be a snare to philosophers and logicians. In a book of this sort it suggests too strongly that the authors, not wishing to antagonize anyone, are playing safe with accepted moralities and religions.

The literary style of the book should certainly appeal to the average student; for it employs his own language, and copies his fast-moving, unpedantic ways of thinking. On p. 78 we are told that "Justice is when you pay your debts," etc., in the most approved Freshman fashion; and (p. 43) that something or other "is seldom this clear cut"; and again, on p. 291, that "we have to go on, therefore, only dialectical elaboration" (where the sense, unfortunately,

is apt to be obscured by the fact that we read "to go on" in its old accepted meaning before we realize that its slangy meaning is in order). Our authors' example of a subjective proposition is "Gosh, I feel tired," and of a proposition which, being false, implies anything you please, "If he's a musician I'll lay an egg." To write a serious and significant book of 462 pages in the Student's English is a stylistic accomplishment.

On the whole, the *Introduction to Philosophical Analysis,* despite many short-comings due to the extreme difficulty of its task, is a full and right-minded book; could the detailed elaboration of the work only have equalled in excellence the general conception, it would have been a pedagogical masterpiece.

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Anthologie des Philosophes français Contemporains. Preface by ARNAUD DANDIEU. Paris. Editions du Sagittaire. 1931. 533 pp.

This collection of contemporary French philosophical writings is bound to be compared to the volumes of personal statements by philosophers which have recently appeared in England, Germany, and America. There are obvious differences, of course, since this anthology is a gathering by editors of texts with biographical introductions, whereas the others consist of professions of faith especially prepared by the philosophers themselves. There is a more important difference, however, to one who is interested in securing a panoramic picture of the state of philosophizing in the different countries concerned. It lies in the principle which has guided the selection of contributors. In England and America the published series have had an official and academic character that would almost justify the title of Contemporary College Teachers of Philosophy. In France the thing has been managed otherwise, with the result that contemporary French philosophy as mirrored in the present volume has a scope far wider and a tone far livelier than that to which we are accustomed. More space is given to the younger thinkers, the non-conformists, the lone wolves, even the *anti-universitaires.*

The matter may perhaps be explained succinctly though imperfectly by the metaphor used in the book's preface by M. Arnaud Dandieu. French philosophers to-day, he says substantially, are either castle-dwellers, or outlaws of the countryside. The castle-dwellers are those who belong to one of the essentially feudal orders or schools: *"le thomisme, l'idéalisme sorbonnard, le freudisme, l'école sociologique, la psychologie behavioriste, le marxisme,"* with their entrenched fortifications, armaments, uniforms, passwords, and

spies. M. Dandieu goes on to elaborate the conveniences supplied by these doctrinal citadels, which, like the castles of old, "contain within their walls whatever is needed to feed and to entertain their inhabitants." Each fortress possesses "its Revue, its poets, its novelists, and its salons, and it may even have its deputations overseas, *où quelque seigneur du fief a fait naguère souche d'un bâtard, par exemple de l'humanisme américain.*"

But outside the castles and their surrounding lands lies the wilderness where other sorts of philosophical combatants may be found. These are the "savages" or hermits of no man's land, who live alone or in small temporary groupings without stated domicile or provision for defense. They have no use for the false security of outmoded battlements, choosing to live dangerously in the open, and confining their activities to occasional raids upon scouting parties, or sapping and mining operations. Among these independents the editor cites MM. Meyerson, Pierre Janet, Lévy-Bruhl, Minkowski, and Jean Wahl, not to mention the more literary rebels. To include these men and the younger writers like Louis Rougier, Georges Politzer, and René Daumal, the editors have sacrificed the inclusion of well-known authors like Boutroux, Rauh, Lachelier, Renouvier, Lagneau, Leroy, Bouglé, Gilson, Chevalier, and Lalande. This is done on the theory, no doubt, that the most stimulating thinking of any period is likely to be found "in opposition," and that vested interests can be relied upon to look out for themselves. Some will probably grumble at the disproportionate outcome of the bargain which excludes so many great scholars and teachers, but there can be no denying that it has resulted in a book that is extraordinarily fresh and awake. Not all the famous names are missing by any means. Besides those already mentioned, the book contains well-chosen selections from Sorel, Henri Poincaré, Hamelin, Durkheim (for the editors include living influences whether or not the man is physically alive), Loisy, Goblot, Bergson, Blondel, Dumas, Maurras, Brunschvicg, Langevin, Baruzi, and Maritain. The introductory critical biographies by different hands are almost uniformly excellent, and the bibliographies useful. It would be instructive to stop and consider more fully the trends of French philosophizing at present as displayed in this collection; but one can only voice the pious hope that as living and dramatic an anthology of America's castellated and uncastellated philosophers may some day be compiled.

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De Luther à Wagner. Essai de psychologie ethnique. N. KLUGMANN et DUMESNIL DE GRAMONT. Préface de J. L. Breton. Paris: J. Vrin. 1931. 2 vols. 227 pp. and 222 pp.

The professed aim of this book is to contribute to international understanding by bringing about a better knowledge in France of the German character, which for the Latin spirit is difficult to grasp. To accomplish this task the authors have addressed themselves to Germany itself and have undertaken to study its great men on the supposition that a people's character is revealed by its men of genius. The list selected for this study is certainly comprehensive,—all fields are represented, religion, philosophy, literature, politics, history, art, and music. From Luther to Wagner German men of genius pass in review and their life and work are subjected to close and searching scrutiny. As a result there emerges the thesis that the salient characteristic of the German soul is its double nature. All great Germans have a *Doppelseele*. And what is more, they are conscious of it, glory in its possession, and unblushingly proclaim it.

As a matter of caution we are warned at the outset that every man is double, no one is perfectly consistent. Only with the Germans inconsistency and contradiction is so marked, so prominent, as to be characteristic. For every good quality there is in the same individual a bad quality, a noble impulse with a base one, with candor, duplicity, with tenderness, brutality, with dreamy vision, a stern sense of reality. The very essence of the German soul, as the authors see it, is contradiction. And the thesis is perfectly illustrated by a study of such men as Luther, Frederick the Great, the Romanticists, and Wagner. Luther protesting against pope or emperor interfering with liberty of conscience and then calling upon princes to permit none but the true, i.e., Lutheran worship, proclaiming the liberty of the Christian and denouncing in terms of unmeasured fury the rebellious peasants who have risen in the name of that liberty, furnishes a good illustration of a double soul. So does Frederick the Great when he writes against the principles of Macchiavelli and then calmly proceeds to put these very principles into practice. And Friedrich Schlegel oscillating between libertinism and asceticism, between atheism and orthodoxy, and finally embracing the doctrines of the Catholic Church, is a typically wavering romantic character. And Beethoven is all devotion to the mighty of the day while he puts forth revolutionary and democratic pronouncements. And Wagner is a bundle of contradictions. His music-dramas breathe the Spirit of renunciation and self-sacrifice while in life he craves luxury and practices self-indulgence, even if he must borrow on all sides from friends and patrons, and weans away from his friends the affection of their wives and daughters.

So the hybridity of the German character is a fact, and it has persisted from the days of Tacitus to the present.

Supposing the thesis proved, we ask what is its bearing on the present time and generation? And here the study has its practical side. The German enigma is a source of alarm to the French, its solution has baffled, and still continues to baffle them, so we are told. And when historical and political problems are touched on in this book, strict objectivity is at an end. The point of view becomes frankly French. The study of Bismarck involves assumptions that are debatable. He is represented as having forced a war upon an innocent and unsuspecting France and his methods were those of deceit and dissimulation. No doubt, Bismarck was not over-scrupulous with his adversaries. But were they more scrupulous,—was any statesman of the time, or for that matter of very recent times, scrupulous in regard to truth? Bismarck coveted the war, not because he liked war, but because there was no other way of achieving his one great goal, German unification under the leadership of Prussia. France made no secret of her opposition to such a plan. It was in her interest to prevent its success,—it was Prussia's interest to carry it through. And the cry of "revenge for Sadowa" and the demands for compensations in the way of annexation of neutral or German territory made it quite plain to Bismarck what opposition he might expect and the only way to overcome it. To be callous to sufferings caused by armed conflict is not a peculiarity confined to German statesmanship. Richelieu had no scruples when it came to the aggrandizement of France. He crushed Protestantism at home, but supported it abroad, even if the horrors of the Thirty Years' War had to be prolonged for fourteen years. In his case, as in Bismarck's, all apparent inconsistency vanishes when viewed against the background of a higher unity—some great purpose to be achieved. And Bismarck was no hypocrite; he did not drag into the conflict nor into the peace-treaties moral issues as was done at Versailles in 1919, with what woeful results the world today fully realizes.

After all, the double soul can be overstressed, and the unity in the character of the men studied can thus be obscured or forgotten. That the German character is complex is undoubted; sentiment plays a large rôle in determining action with the German people. But is not that the case elsewhere too? Even in France things do not always proceed by inexorable logic. Wagner may be thoroughly inconsistent in many ways, but when it comes to his art he presents a splendid example of singleness of purpose. He never compromised his ideals for pecuniary gain or worldly honor. It is not just to argue (as is done in Vol. II, p. 163) that he was ready to profit from the *liaison* of his niece Johanna with a Prussian prince to get his

Tannhäuser performed in Berlin. The letter cited has a note of bitter irony (see Kapp, *Wagner und die Frauen*, p. 117) which authors fail to appreciate. Besides, the facts in this particular case are well known. Wagner could have had his *Tannhäuser* performed in Berlin, if he had acceded to the requests of the management. But fearing a bad performance, he stipulated that Liszt must supervise and that was met with refusal. He finally had to surrender, but only dire need drove him to it (see the Liszt-Wagner correspondence of 1854). And did he not later oppose his royal friend, the King of Bavaria, in the matter of single performances of the Ring? And after all why did the Paris performance of *Tannhäuser* fail? Surely it will not do to minimize the personal element, the rancorous opposition of the Jockey-club on account of Wagner's refusal to insert the customary ballet, and to attribute the fiasco to the inability of the French public to understand the German double soul in *Tannhäuser*. Nor will such an explanation explain the conduct of the insanely jealous Berlioz. The account of this affair given by Kapp in his well-known little book *Das Dreigestirn* (pp. 85–107) is absolutely convincing. And the attempt to minimize the influence of Mathilde Wesendonck on the genesis of *Tristan and Isolde* is not particularly successful. That famous letter to Liszt in which Wagner announces his plan of writing his great love-drama contains a passage asserting he had never known the happiness of real love, and therefore he wished to erect a monument to this fairest of dreams. The authors evidently think this implies he was not yet in love with Mathilde when he wrote these words and therefore *Tristan* could not have been inspired by her. But reference is plainly to Wagner's experiences with his wife Minna. To be sure, the climax of the passion came some years later, but the master had met Mathilde two years earlier, and from the very beginning he had shown more than ordinary interest in his friend and muse. Letters to Liszt from the years 1853 touching on his unhappy marriage speak a plain language.

But these criticisms affect only certain points. On the whole the book shows sound learning and makes interesting reading. Whether its thesis can be turned to important use in the present international situation is not at all certain. That the German enigma troubles the peace of mind of the French people may be true enough. But that the enigma is equally troublesome to the rest of the world may be doubted. If the German Sphinx has recently proposed its riddle more cruelly than ever to an uneasy France (as we are told, Vol. I, p. 17), it is for reasons that most historians have no trouble to explain. In the preface (p. 8) it is stated that an international tribunal, if its decisions are not to leave behind resentments leading to new wars, should act less as judge and more as arbiter; only thus a durable and

loyal entente between peoples can be established. Precisely—and because the statesmen who made the Treaty of Versailles acted in any other spirit except that of such a tribunal the world is today confronted by so many enigmas.

"Or, pour s'entendre, il faut se connaître." Anything that will make for better mutual understanding of the French and German peoples is certainly to be welcomed. And this book, brilliantly and interestingly written, deserves the attention of all students of international affairs.

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NOTES AND NEWS

The American Academy of Political and Social Science offers for 1933 two research fellowships in the Social Sciences: (1) The Simon N. Patten Fellowship carrying a stipend of $1,000, and (2) The James-Rowe Fellowship carrying a stipend of $2,000.

These fellowships will be assigned to the two applicants who submit what appears to the officers of the Academy to be the most worthwhile research projects in the field of the social sciences. The amount of the stipends will obviously place certain limitations on the type of project submitted, but on the other hand, the officers will not be averse to consider these fellowships as grants-in-aid which may enable the candidate to complete a good project already begun. As to problems of investigation, those candidates will be given preference who submit research projects which intimately bear upon the economic and social questions which in the light of present conditions urgently require solution.

Candidates for those fellowships must possess the degree of Ph.D. or its equivalent. If the qualifications of the candidate are exceptional, this formal requirement may be waived.

The Academy reserves the right to publish the results of the researches carried on by the aid of these fellowships. The manuscripts embodying the results of the researches in question must be submitted in the English language on or before July 1, 1934.

Applications for fellowships must be made on special forms supplied by the Academy on request. These applications must reach the Committee in charge on or before November 1, 1932.

Appointments to fellowships will be announced as soon as possible after December 15, 1932, and in the January, 1933, issue of the *Annals of the American Academy of Political and Social Science.* Address all communications to Chairman, Fellowship Committee, American Academy of Political and Social Science, 3457 Walnut Street, Philadelphia, Pa.